SEMESTER EXAMINATION, DECEMBER, 2025

Course Name: - M.Tech (AIDS) **Semester:- 1st**

Paper Name: - Advance Data Structure & Algorithms **Paper Code:- MCSDS-5001**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। **अधिकतम अंक–70**

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न **तीन अंक** का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में **सात प्रश्नों में से किन्हीं** पाँच प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **सात अंक** का है।
- खण्ड–स में **तीन प्रश्नों में से किन्हीं** दो प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **10 अंक** का है।

Section – A (खण्ड–अ)

Multiple Choice Questions (बहुविकल्पीय प्रश्न)

1. Answer all the following questions. **5x3 =15**
निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) In a B-tree of order m, the maximum number of keys a node can contain is:
A. m B. m – 1 C. 2m – 1 D. m + 1

ii) Randomized Quick Sort has expected time complexity:
A. $O(n^2)$
B. O(n log n)
C. O(log n)
D. O(n)

iii) Which structure supports ordered dictionary operations efficiently?
A. Hash Table
B. B+ Tree
C. Stack
D. Trie

iv) The amortized cost of Splay Tree operations is best described as:
A. O(log n) worst case
B. O(n) per operation
C. O(log n) amortized
D. O(1) amortized

v) An algorithm with amortized O(1) cost can still have:
A. No worst case
B. Constant worst case
C. Linear worst case
D. Logarithmic worst case

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Section - B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions. **5x7=35**
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर दें।

(i) Define Probablistic Analysis and write an algorithm for Hiring Problem ?

(ii) Write a difference Between Deterministic and Non-Deterministic Algorithm?

(iii) What is cuckoo hashing explain Worst Case O(1) ?

(iv) Amortized analysis is Useful for what factors ?

(v) Explain the different types of graph with there representation ?

(vi) what are the splay tree? Describe the properties of splay tree ?

(vii) Step-by-Step Construction of the AVL Tree for the given Sequence 10, 15, 9, 12, 13,79, 45, 36, 22 .

Section - C (खण्ड–स)
Descriptive Questions (वर्णनात्मक प्रश्न)

3. Answer any two of the following question. **2x10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर दें।

(i) What do you mean by a hash table and a hash function? Explain the following hash functions with an example

(a). Division method (b). Mid square (c). Digit analysis

(ii) Create a RED BLACK Tree by inserting following sequence of number

8, 18, 5, 15, 17, 25, 40 & 80

(iii) What do you mean by a balance factor in AVL tree and explain about LL & RR rotations with an example.

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